

JUL 27 2006

Applicant: Miles et al.
Application No.: 10/612,133**REMARKS**

After the foregoing amendment, claims 1-19 and 21-23 are currently pending in this application. Claim 22 has been withdrawn from consideration as being directed to a non-elected species of invention. By way of this Reply, claims 1, 21, and 23 have been amended, without prejudice. Page 4 of the specification, with respect to the published international application, has been amended to identify Figure 4. Applicants submit that no new matter has been introduced into the application by these amendments.

Objections to the Specification

The Examiner maintained the objection to the Title of this application as being non-descriptive. The undersigned contacted the Examiner on July 27, 2006 to discuss the Examiner's grounds for maintaining this objection, and the Examiner stated that the title, "Resonant Scanning Probe Microscope" is too generic, but that he would consider Applicants remarks to the contrary submitted in the present Reply. Applicants respectfully disagree with the Examiner and submit that based on the arguments presented below, the present title of this invention is appropriately describes inventive features of the present application. Withdrawal of the objection to the title of this application is respectfully requested. If the Examiner believes that this objection should be maintained after considering the below remarks, he is invited to contact Applicants' undersigned representative via telephone to resolve this objection.

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The Specification has also been objected for failure to describe Figure 4. The specification has been amended to describe Figure 4, and based on this amendment, the objection to the specification is believed to be moot.

Claim Rejections – 35 U.S.C. § 112, second paragraph

1. *Claims 1-19, 21, and 23*

Claims 1-19, 21, and 23 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner asserts that the term “non-localized” is not supported by the Specification, and constitutes new matter. Claims 1-19, 21 and 23 have also been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite stating that it is unclear as to what it means to have “non-localized” oscillatory motion.

While Applicants respectfully disagree with both grounds of rejection, claims 1, 21, and 23 have been amended to delete this term. Based on this amendment, Applicants respectfully request withdrawal of both grounds of rejection rejections.

2. *Claim 17*

Claim 17 has also been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. In particular, the Office Actions states that it is “unclear how providing a linear translation of the probe and sample in a direction orthogonal to a plane in which the probe is (laterally) oscillated, defines a rectangular scan area.”

Applicants respectfully traverse this rejection, and provide the following explanation to assist the Examiner’s understanding of claim 17. Claim 17 (read in

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view of claims 1 and 12 from which it depends) recites that the probe is oriented substantially vertically and laterally oscillated across the sample surface. The lateral oscillation of the probe provides a plane of oscillation defined by the length and direction of oscillatory motion of the probe tip. Claim 17 further recites that "the driving means provides a relative linear translation of the probe and sample in a direction substantially orthogonal to a plane in which the probe is oscillated." A direction substantially orthogonal to the plane of oscillation will be outside of the plane of oscillation, causing the probe tip to describe a scan pattern as illustrated in Figure 4. In Figure 4, the broken arrow line illustrates the direction of translation of the probe and sample.

Based on the foregoing, Applicants respectfully request withdrawal of the indefiniteness rejection of claim 17.

Claim Rejections – 35 U.S.C. § 102(b)

Claims 21 and 23 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,254,854 (Betzig). Applicant respectfully traverses this rejection for the reasons set forth below.

Independent claim 21 of the present invention recites, in pertinent part, "laterally oscillating either the probe ... or the sample ... at or near its resonant frequency ... such that an arrangement of scan lines, whose maximum length is directly determined by oscillation amplitude, covers the scan area". Similarly, independent claim 23 recites, in pertinent part, "each scan line being provided by

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laterally oscillating either the probe or the sample at or near its resonant frequency such that oscillation amplitude directly determines scan line length ...".

Betzig is distinguishable from the presently claimed invention because it fails to disclose a scan line provided by means of a resonant oscillation. The resonant oscillations of Betzig are performed for the purpose of measuring the shear force interaction between probe and sample, which is distinguishable from using resonant oscillation to provide a scan line. The shear force interaction between the probe and sample is used as a feedback parameter and/or to provide an indication of interaction strength with which to reconstruct the so-called shear-force image (see, for example, column 5, lines 10-11 of Betzig). The present application provides for measuring shear force interaction, and expressly distinguishes between using resonant oscillations to measure shear force interaction and using resonant oscillations to provide scan lines. See specification at pg. 13, lines 6-22.

While Betzig discloses that "a lateral, periodic (e.g., sinusoidal) oscillation is readily imparted to the probe tip by the actuator", these oscillations do not extend over the length of a scan line, but rather, are limited to individual pixels. In this respect, Betzig is no more relevant than the previously cited prior art, and the arguments in Applicants' February 21, 2006 Reply remain applicable. Namely, "the critical difference between the prior art resonant oscillations and those of the present invention is that the prior art requires single pixel images to be respectively collected over multiple (resonant) oscillations, whereas the present invention

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requires a single (resonant) oscillation to sweep across multiple pixels." February 21, 2006 Reply at pg. 17.

The scan lines in Betzig are separate and distinct from the resonant oscillation. For example, the disclosure at column 2, lines 8-29, of Betzig refers to a means for displacing the probe tip. The relative tip displacement includes a scan pattern, such as a raster scan, which lies substantially in a plane (lines 15-17) and the displacement means also includes means for oscillating the probe tip (line 20). Similarly, Figure 8 illustrates the raster scan comprising X and Y translations with driving waveforms 190, 180, respectively, and a superimposed resonant or near-resonant oscillatory motion 160 along the Y axis driven by a separate waveform 200.

Therefore, it is respectfully submitted that the Office Action misinterprets Betzig by stating that "each scan line (not shown) [is] provided by laterally oscillating (see col. 3, lines 10-12) either the probe or the sample near resonant frequency (see col. 3, lines 25-30)." This passage from Betzig cited by the Examiner describing lateral oscillation simply describes the superimposed oscillations that are independent of the scan. The scan lines in Betzig are provided by simple translations of the probe and/or sample, as is standard in the art. The scan lines of the present invention are directly provided by oscillating either the probe or the sample at or near resonance, as opposed to simply translating the probe across the sample as in Betzig.

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The Office Action further misinterprets Betzig stating, "oscillation amplitude inherently determines scan line length." With reference to Figure 8 of Betzig it is clear that the resonant oscillatory motion 160 makes no contribution to scan line 170 length. The oscillatory motion of Betzig is of smaller amplitude and for the purpose of obtaining information about a single pixel of the image. A scan line must, by its very nature, extend across multiple pixels. This arrangement of Betzig is distinguishable from claims 21 and 23 of the present invention which recite "an arrangement of scan lines, whose maximum length is directly determined by oscillation amplitude, covers the scan area", and "oscillation amplitude directly determines scan line length", respectively.

Accordingly, withdrawal of the anticipation rejection of Betzig is respectfully requested.

Claim Rejections - 35 U.S.C. § 103(a)

1. Claims 1, 3, and 12-18

Claims 1, 3, and 12-18 have been rejected under 35 U.S.C. § 103(a) as being obvious over Betzig in view of U.S. Patent No. 6,008,489 (Elings et al.). With respect to the stated ground for rejecting claim 1, Betzig was applied for the reasons set forth with respect to claims 21 and 23, and Elings was applied for its disclosure of averaging values.

Similar to claims 21 and 23, independent claim 1 of the present invention recites that "each scan line being provided by laterally oscillating either the probe

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or the sample at or near its resonant frequency such that oscillation amplitude directly determines scan line length" Applicants respectfully submit that Betzig is distinguishable from independent claim 1 for the same reasons set forth above with respect to claims 21 and 23, and Elings does not resolve the above-noted shortcomings of Betzig.

Accordingly, withdrawal of the obviousness rejection of independent claim 1 is respectfully requested. In addition, claims 3 and 12-18, which depend from claim independent claim 1 are distinguishable from the cited prior art for the same reasons.

2. *Claims 1-4, 6-19, and 21*

Claims 1-4, 6-19, and 21 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,752,008 (Kley) in view of Betzig and Elings. With respect to independent claims 1 and 21, the Office Action states, in pertinent part, that Kley discloses "carry[ing] out a scan of the sample surface wherein scan area is covered by an arrangement of scan lines (see Fig. 3), each scan lines provided by laterally oscillating either the probe or the sample at a frequency. The oscillation amplitude inherently (see Fig. 3) determines a maximum scan line length." However, the Office Action notes that Kley does not disclose "oscillating at or near a resonant frequency," but that Betzig teaches "oscillating a resonant frequency."

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As discussed in detail in Applicants' February 21, 2006 Reply, Kley is distinguishable from the present invention because it does not disclose a scan performed by means of resonant oscillations. Specifically, page 21 of Applicants' February 21, 2006 Reply states:

the oscillations of ... Kley ... are carried out as part of the measuring process for obtaining a single image pixel or point, and, therefore, are more efficiently carried out as vertical oscillations. The oscillations of the present invention are distinguishable from the ... oscillations [of Kley] because each oscillation laterally sweeps across the sample surface in order to gather information from multiple pixels or points on the sample surface. That is the oscillatory motion of the present invention is carried out across the sample surface and not localized to a single image pixel. Each scan line is directly provided by oscillating either the probe or the sample at or near resonance, as opposed to simply translating the probe, as in the X-Y and Z translation stages of Kley. Finally, oscillation amplitude in the present invention directly determines scan line length, whereas, in [Kley], oscillation amplitude, at most, determines resolution of a pixel at one point on the scan line.

Therefore, the Office Action misinterprets Kley to the extent that it states Kley discloses a scan line provided by lateral oscillation of the probe or sample, and that oscillation amplitude determines maximum scan line length in Kley.

Furthermore, as noted by the Examiner, Kley does not disclose "oscillating either the probe or the sample at or near its resonant frequency" to determine maximum scan line length. For the reasons set forth in detail above, Betzig and Elings also fail to disclose a scan performed by resonant oscillation, and, thus, do not resolve shortcomings of Kley.

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Accordingly, withdrawal of the obviousness rejection of independent claims 1 and 21 is respectfully requested. In addition, claim 2-4 and 6-19, which depend from claim independent claim 1 are distinguishable from the cited prior art for the same reasons.

3. Claim 5

Claim 5 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. Kley in view of Betzig and Elings and further in view of U.S. Patent No. 6,614,227 (Ookubo).

Kley, Betzig, and Elings are distinguishable from the presently claimed invention for the reasons set forth above, and Ookubo does not resolve the above-noted shortcomings in these references. Furthermore, claim 5 is dependent from claim 1, and is distinguishable from the cited prior art for the same reasons set forth above with respect to claim 1.

Accordingly, withdrawal of the obviousness rejection of claim 5 is respectfully requested.

Conclusion

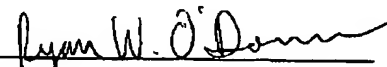
If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

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In view of the foregoing remarks, Applicants respectfully submit that the present application, including claims 1-19 and 21-23, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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